



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/300,022	04/27/1999	F. JOSEPH POMPEI	109026-005P1	3989

21323 7590 12/05/2003

TESTA, HURWITZ & THIBEAULT, LLP
HIGH STREET TOWER
125 HIGH STREET
BOSTON, MA 02110

EXAMINER

PENDLETON, BRIAN T

ART UNIT

PAPER NUMBER

2644

DATE MAILED: 12/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/300,022

Applicant(s)

POMPEI, F. JOSEPH

Examiner

Brian T. Pendleton

Art Unit

2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 April 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 28-33 and 37-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 28-33, 37 and 39 is/are rejected.
- 7) ☒ Claim(s) 38 and 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,5,6,8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 30 and 39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 30 recites the limitation "the apparent source has a moving location" in line

1. There is insufficient antecedent basis for this limitation in the claim.

Claim 39 recites the limitation "the desired level is unity" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 28, 30 and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by Manabe. Manabe discloses a loudspeaker 40 having ultrasonic transducers 41, ultrasonic signal source 50 (carrier), audio signal source 10, and amplitude modulator 20 for modulating the carrier with the audio signal source. As taught in column 8 lines

25-36, the ultrasonic signal source 50 has a frequency above that of human hearing. Power amplifier 30 is means for applying the modulated carrier to the transducers 41. Claim 1 is met. As to claim 28, the apparatus of figure 2 modulates an ultrasonic carrier with an audio signal and directs a beam toward a location P by using a curved speaker structure. See figure 4 also. Regarding claim 30, figure 5 shows a listener position recognizer 60. Taught in column 8 line 64 – column 10 line 28, the curvature of the parametric speaker changes to direct the sound beam at the listener, even when he/she moves. As to claim 37, the apparatus of Manabe directs a beam of sound toward listening location P.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Mattila, "Bandwidth Control of an Electrostatic Ultrasonic Transducer". Manabe discloses a loudspeaker 40 having ultrasonic transducers 41 (at least a first and second transducer), ultrasonic signal source 50 (carrier), audio signal source 10, amplitude modulator 20 for modulating the carrier with the audio signal source and driver 30. Manabe does not teach that the transducers have first and second acoustical-mechanical resonances whereby one transducer has a higher resonance frequency than the other transducer. Mattila teaches that the bandwidth of

an electrostatic ultrasonic transducer can be increased by using a multiple sized groove pattern in the backplate of the transducer (see abstract). In addition, sections 3 and 4 suggest that by having different depths of the grooves in the backplate of the ultrasonic speaker, different individual transducers with unique resonance frequencies can be achieved. As a result, the bandwidth of the transducer is widened. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to have the transducers in the Manabe invention have different resonances, per the teachings of Mattila. Modifying the Manabe apparatus in that fashion would have increased the bandwidth of the loudspeaker 40, an advantageous feature. Inherently, one transducer would have a higher resonance frequency than the other transducer. As to claim 5, ultrasonic transducers have ultrasonic energy above the human hearing frequency range.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Mattila as applied to claim 3 above, and further in view of Alexander. The combination of Manabe and Mattila disclose an ultrasonic transducer with an ultrasonic signal source, first and second ultrasonic transducers with different resonance frequencies, an audio signal source, modulator and means for driving the transducer. The combination does not teach a means for splitting the modulated carrier into upper and lower frequency range signals and driving the first transducer with lower frequency signals and the second transducer with upper frequency signals. Nonetheless, the feature was already known in the art, recognized as a crossover circuit. Such circuits were common, as evidenced by Alexander, in the art of multiple transducer

Art Unit: 2644

loudspeakers. Shown in figure 1, an audio signal inputted into terminal 10 is split into a high frequencies and low frequencies for reproduction by two separate transducers 18 and 24. Since it was well known to separate an input signal source into frequency ranges for reproduction by multiple transducers, it would have been obvious to one of ordinary skill in the art at the time of invention to do so in the combination of Manabe and Mattila.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Mattila in further view of Alexander as applied to claim 4 above, and further in view of Cherek et al. The combination of Manabe, Mattila and Alexander teach an apparatus comprising an ultrasonic transducer with an ultrasonic signal source, first and second ultrasonic transducers with different resonance frequencies, an audio signal source, modulator, means for driving the transducer and means for splitting the modulated carrier into upper and lower frequency range signals and driving the first transducer with lower frequency signals and the second transducer with upper frequency signals. The combination does not teach that the driving means includes an inductor conducted to resonate with the capacitive element of the transducer, providing an electrical resonance corresponding with the acoustical-mechanical resonance of the transducer. Cherek et al disclose a matching transformer for ultrasonic transducer. As suggested in column 1 lines 17-42, it was common to use transformers or other inductive components in matching circuits for the purpose of increasing the quality factor of the transducer circuit. That was an advantageous feature. Thus, it would have been obvious to one of ordinary skill in the art at the time

of invention to include an inductor in the driving means in the apparatus described by the teachings of Manabe, Mattila and Alexander.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hossack in view of Cherek et al. Hossack teaches an electrostatic transducer comprising a pair of electrodes (backplate 12 and conductive membrane 18) having a capacitance between them, inherently an ultrasonic signal generator whereby the transducer has a mechanical resonance. However, Hossack does not teach that the drive circuit for the transducer has an inductance. Cherek et al disclose a matching transformer for ultrasonic transducer. As suggested in column 1 lines 17-42, it was common to use transformers or other inductive components in matching circuits for the purpose of increasing the quality factor of the transducer circuit. As shown in the figure, a transformer (inductance) is in series with the transducer. That was an advantageous feature. Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to include an inductor in the driving means in the apparatus described by Hossack. Per claim 8, the transducer is a capacitive membrane-type transducer since backplate 12 and gold layer 18 form a capacitor.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hossack in view of Cherek et al as applied to claim 7 above, and further in view of Brzezinski et al. The combination of Hossack and Cherek et al teaches an apparatus with a pair of electrodes with a capacitance between them, an ultrasonic signal generator, and inductor in series with the driving circuit. The combination does not explicitly state that the transducer is a piezoelectric transducer. Brzezinski et al teach a backplate 110,

dielectric spacer 500 and conductive membrane 625. As suggested in column 6 lines 5-10, the membrane 625 can be a piezoelectric polymer. Therefore, it was well known to use piezoelectric materials in ultrasonic transducers as the conductive membrane. Their use lowered the cost of the apparatus. Thus, it would have been obvious to one of ordinary skill in the art at the time of invention to use the piezoelectric diaphragm of Brzezinski et al in the apparatus of Hossack and Cherek et al.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Cherek et al. Manabe discloses a loudspeaker 40 having ultrasonic transducers 41 (at least a first and second transducer), ultrasonic signal source 50 (carrier), audio signal source 10, amplitude modulator 20 for modulating the carrier with the audio signal source and driver 30. Manabe does not teach an inductor in series with the driver 30. However, as discussed above, it would have been obvious to one of ordinary skill in the art at the time of invention to provide an inductor in series with the driver, per the teachings of Cherek et al, in the invention of Manabe. Including the inductor would have increased the quality factor of the transducer circuit.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Norris '915. Manabe discloses a loudspeaker 40 having ultrasonic transducers 41 (at least a first and second transducer), ultrasonic signal source 50 (carrier), audio signal source 10, amplitude modulator 20 for modulating the carrier with the audio signal source, driver 30 and a listener position recognizer 60 which adjusts the curvature of the parametric speaker to direct the sound beam at the listener, even when he/she moves. Manabe does not teach directing a visual image onto a moving

location. That limitation was well known in the art. Norris '915 teaches an ultrasonic speaker 10 which directs a light beam 78 (visual image) onto a moving location (a person). Column 6 lines 26-37 disclose that the speaker can project the light beam and sound source onto a distant target such that it appears that the visual image and sound are emanating from the distant target (the wall). It would have been obvious to one of ordinary skill in the art at the time of invention to direct a visual image onto the moving location in the invention of Manabe, per the teachings of Norris. The advantage was that visual information that complemented the audio sound could also follow the listener as he/she moved.

Claims 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manabe in view of Hirayanagi. Manabe discloses a loudspeaker 40 having ultrasonic transducers 41 (at least a first and second transducer), ultrasonic signal source 50 (carrier), audio signal source 10, amplitude modulator 20 for modulating the carrier with the audio signal source and driver 30. Manabe does not disclose using a surface that absorbs or reflects ultrasonic energy and reflects audio energy.

Nonetheless, that feature was well known in the art of ultrasonic speakers as evidenced by Hirayanagi. Hirayanagi teaches an ultrasonic speaker system with an acoustic reflector 2 for reflecting the ultrasonic energy from the transducer 50. As column 7 lines 47-54 teach, the acoustic sound is dispersed from the reflector 2, leading to a non-directional audio signal source. It would have been obvious to one of ordinary skill in the art at the time of invention to use the reflector 2 of Hirayanagi in the apparatus of Manabe for the purpose of generating a diffused audio sound, an advantageous feature.

The resultant sound in Manabe would have created a sound with more ambiance for the listener. As to claim 33, as discussed above, both Manabe and Hirayanagi teach a beam steering technique.

Allowable Subject Matter

Claims 38 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

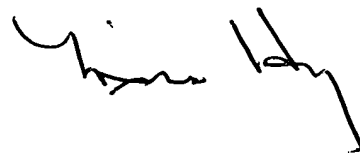
Claim 39 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian T. Pendleton whose telephone number is (703) 305-9509. The examiner can normally be reached on M-F 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on (703) 305-4386. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.



**MINSUN OH HARVEY
PRIMARY EXAMINER**